

Claims

[c1] I claim:

1.A method for determining frequency values associated with forces applied to a device, comprising:

determining a first plurality of spectral amplitude values associated with a first forcing waveform applied to the device;

determining a second plurality of spectral amplitude values associated with a second forcing waveform applied to the device;

determining a maximum spectral amplitude value based on the first and second plurality of spectral amplitude values;

determining a threshold amplitude value based on the maximum spectral amplitude value and an acceptance value;

determining a first plurality of desired frequency values by selecting frequency values associated with a subset of the first plurality of spectral amplitude values that are greater than or equal to the threshold amplitude value; and,

determining a second plurality of desired frequency values by selecting frequency values associated with a sub-

set of the second plurality of spectral amplitude values that are greater than or equal to the threshold amplitude value.

[c2] 2.The method of claim 1 wherein the step of determining the first plurality of spectral amplitude values includes: determining a first forcing waveform indicative of a force applied to the device over an integral number of rotations of the device; removing a DC component of the first forcing waveform to obtain a first modified forcing waveform; and, calculating the first plurality of spectral amplitude values associated with the first modified forcing waveform.

[c3] 3.The method of claim 2 wherein the step of calculating the first plurality of spectral amplitude values includes applying a Fourier transform on the first modified forcing waveform to obtain the first plurality of spectral amplitude values.

[c4] 4.The method of claim 2 wherein the first forcing waveform is determined from data collected over an integral number of revolutions of the device.

[c5] 5.The method of claim 1 wherein the step of determining the maximum spectral amplitude value includes: determining a first maximum value by determining a

highest value in the first plurality of spectral amplitude values;

determining a second maximum value by determining a highest value in the second plurality of spectral amplitude values; and,

selecting the greater value of the first maximum value and the second maximum value to obtain the maximum spectral amplitude value.

[c6] 6.The method of claim 1 wherein the step of determining the threshold amplitude value includes multiplying the maximum spectral amplitude value by the acceptance value to obtain the threshold amplitude value.

[c7] 7.An article of manufacture, comprising:
a computer storage medium having a computer program encoded therein for determining frequency values associated with forces applied to a device, the computer storage medium including
code for determining a first plurality of spectral amplitude values associated with a first forcing waveform applied to the device;
code for determining a second plurality of spectral amplitude values associated with a second forcing waveform applied to the device;
code for determining a maximum spectral amplitude value based on the first and second plurality of spectral

amplitude values;
code for determining a threshold amplitude value based on the maximum spectral amplitude value and an acceptance value;
code for determining a first plurality of desired frequency values by selecting frequency values associated with a subset of the first plurality of spectral amplitude values that are greater than or equal to the threshold amplitude value; and,
code for determining a second plurality of desired frequency values by selecting frequency values associated with a subset of the second plurality of spectral amplitude values that are greater than or equal to the threshold amplitude value.

- [c8] 8. The article of manufacture of claim 7 wherein the code for determining the first plurality of spectral amplitude values includes:
code for determining a first forcing waveform indicative of a force applied to the device over an integral number of rotations of the device;
code for removing a DC component of the first forcing waveform to obtain a first modified forcing waveform;
and,
code for calculating the first plurality of spectral amplitude values associated with the first modified forcing

waveform.

- [c9] 9.The article of manufacture of claim 7 wherein the code for calculating the first plurality of spectral amplitude values includes:
code for applying a Fourier transform on the first modified forcing waveform to obtain the first plurality of spectral amplitude values.
- [c10] 10.The article of manufacture of claim 7 wherein the first forcing waveform is determined from data collected over an integral number of revolutions of the device.
- [c11] 11.The article of manufacture of claim 7 wherein the code for determining the maximum spectral amplitude value includes:
code for determining a first maximum value by determining a highest value in the first plurality of spectral amplitude values;
code for determining a second maximum value by determining a highest value in the second plurality of spectral amplitude values; and,
code for selecting the greater value of the first maximum value and the second maximum value to obtain the maximum spectral amplitude value.
- [c12] 12.The article of manufacture of claim 7 wherein the

code for determining the threshold amplitude value includes code for multiplying the maximum spectral amplitude value by the acceptance value to obtain the threshold amplitude value.

- [c13] 13.A system for determining frequency values associated with forces applied to a device, comprising:
- a first sensor operably coupled to the device, the first sensor generating a first signal over time indicative of a first forcing waveform applied to the device;
 - a second sensor operably coupled to the device, the second sensor generating a second signal over time indicative of a second forcing waveform applied to the device;
 - and,
 - a computer operably communicating with the first and second sensors, the computer configured to determine a first plurality of spectral amplitude values associated with the first forcing waveform, the computer is further configured to determine a second plurality of spectral amplitude values associated with the second forcing waveform, the computer is further configured to determine a maximum spectral amplitude value based on the first and second plurality of spectral amplitude values, the computer is further configured to determine a threshold amplitude value based on the maximum spectral amplitude value and an acceptance value, the com-

puter is further configured to determine a first plurality of desired frequency values by selecting frequency values associated with a subset of the first plurality of spectral amplitude values that are greater than or equal to the threshold amplitude value, the computer is further configured to determine a second plurality of desired frequency values by selecting frequency values associated with a subset of the second plurality of spectral amplitude values that are greater than or equal to the threshold amplitude value.

- [c14] 14.A system for determining frequency values associated with forces applied to a device, comprising:
- a first sensor means operably coupled to the device for generating a first signal over time indicative of a first forcing waveform applied to the device;
 - a second sensor means operably coupled to the device for generating a second signal over time indicative of a second forcing waveform applied to the device; and,
 - a computer means for operably communicating with the first and second sensors, the computer means configured to determine a first plurality of spectral amplitude values associated with the first forcing waveform, the computer means is further configured to determine a second plurality of spectral amplitude values associated with the second forcing waveform, the computer means

is further configured to determine a maximum spectral amplitude value based on the first and second plurality of spectral amplitude values, the computer means is further configured to determine a threshold amplitude value based on the maximum spectral amplitude value and an acceptance value, the computer means is further configured to determine a first plurality of desired frequency values by selecting frequency values associated with a subset of the first plurality of spectral amplitude values that are greater than or equal to the threshold amplitude value, the computer means is further configured to determine a second plurality of desired frequency values by selecting frequency values associated with a subset of the second plurality of spectral amplitude values that are greater than or equal to the threshold amplitude value.